WHAT IS CLAIMED IS:

1. An electromagnetic actuator comprising:

a stationary assembly that includes two coils disposed coaxially with each other inside a hollow stator yoke composed of a soft magnetic material; and

a movable assembly that includes a movable magnet unit and movable yoke unit both disposed inside the coils with a very small clearance therefrom so as to be movable in the axial direction,

wherein the movable assembly travels in the axial direction by the interaction between a magnetic field generated by the movable magnet unit and a current passing through the coils.

2. An electromagnetic actuator according to Claim 1, wherein the direction of the current passing through one of the two coils is opposite from the direction of the current passing through the other coil.

3. An electromagnetic actuator according to Claim 1, wherein the two coils are wound on respective separate bobbins made of a synthetic resin and having a substantially identical shape with each other, and the two bobbins with the respective coils wound thereon are disposed axially inside the stator yoke with a predetermined distance provided therebetween.

4. An electromagnetic actuator according to Claim 1 or 3, wherein

the stator yoke of the stationary assembly is a hollow cylinder, the two coils are ring-shaped and wound on the respective cylindrical bobbins;

the movable assembly has a supporting shaft at the center thereof, the movable yoke unit is located such that the movable yoke unit and the two coils effect electromagnetic action on each other; and

a pair of flanges are provided at both axial end surfaces of the stator yoke, each flange having a bearing mechanism, the supporting shaft is retained by the bearing mechanisms so as to be movable in the axial direction.

5. An electromagnetic actuator according to any one of Claims 1 to 4, wherein the movable magnet unit of the movable assembly is formed of at least one columnar or hollow magnet axially magnetized with two opposite polarities, namely, north pole and south pole, and the movable yoke unit is constituted by a pair of soft magnetic members that have a substantially identical configuration with each other and are disposed to sandwich the movable magnet unit and to abut respectively against a north-pole end surface and a south-pole surface thereof.

6. An electromagnetic actuator according to any one of Claims 1 to 4, wherein the movable yoke unit of the

movable assembly is constructed by one or more columnar or hollow soft magnetic members, the movable magnet unit is constructed by a pair of magnets that have a substantially identical configuration with each other, are disposed to sandwich the movable yoke unit and to abut against both axial end surfaces thereof and are magnetized so that the inward portion and the outward portion of one magnet are polarized oppositely from each other and that the outward portion of one magnet is polarized oppositely from the outward portion of the other magnet.

7. An electromagnetic actuator according to Claim 5, wherein the outer diameter of the movable magnet unit of the movable assembly is set to be smaller than the outer diameter of the movable yoke unit.

8. An electromagnetic actuator according to Claim 6, wherein the outer diameter of the movable yoke unit of the movable assembly is set to be smaller than the outer diameter of the movable magnet unit.

9. An electromagnetic actuator according to Claim 7 or 8, wherein the travel distance of the movable assembly in the axial direction is set to 1.0 mm or less.

10. An electromagnetic actuator comprising:

a stationary assembly that includes a plurality of paired coils each of which is composed of two coils and which

are disposed coaxially with each other inside a hollow stator yoke composed of a soft magnet material; and

a movable assembly in which movable units, each comprising a movable magnet unit and a movable yoke unit, of a plural munber identical with that of the paired coils are axially disposed on a same axis inside the coils in such a manner as to be spaced apart from the stationary assembly by a very small distance,

wherein the movable assembly travels in the axial direction by the interaction between magnetic fields generated by the movable magnet unit and currents passing through the coils.

11. A composite electromagnetic apparatus which comprises:

an electromagnetic actuator according to any one of Claims 1 to 9;

a stepping motor disposed on the same rotating shaft as the electromagnetic actuator; and

a converting mechanism for converting the rotational motion of the rotating shaft by the stepping motor into a linear motion, and in which

the electromagnetic actuator causes the rotating shaft to move linearly,

wherein rough adjustment by the stepping motor is performed in an open loop, while fine adjustment by the electromagnetic actuator is performed in a closed loop.

12. A composite electromagnetic actuator apparatus according to Claim 11, wherein the stepping motor is a two-phase claw-pole type.

13. A composite electromagnetic actuator apparatus according to Claim 12, which is used as an actuator for positioning an information read/write head to a target track on a recording medium of an information storage device.

14. An electromagnetic actuator apparatus according to Claim 11, wherein a spacer composed of a nonmagnetic member is disposed between the stepping motor and the electromagnetic actuator.